MDARC CARRIER

Volume XLV Number 4 WWW.MDARC.ORG April 1998

April Meeting

Friday, April 17

8:00 PM

Julie Sawyer
California PUC

Our Savior's Lutheran Church
1035 Carol Lane
Lafayette, CA

Julie will give a presentation on the topic of power deregulataion. As many of you know, the California Public Utilities Commission has recently opened the market to competition and many new companies are taking advantage of the opportunity to compete in a market that was once the exclusive domain of PG&E.

Presidential QRM

By Sam Lipson, KO6JR

April is here and so is spring. Wildflowers are in bloom and no better time than to use amateur radio in support of public service events. Jeff, KF6EUM, will be at all of our meetings soliciting help in this area. Please try to help out as much as you can. You can be assured that we will have events on almost every weekend from now through October. Also, this year we have two big events: The Police Games and the Firefighter Games. The former will occur just before Field Day and the latter in August.

We also have many events to look forward to before this year is out. It is time to begin planning for Field Day as well as the Club July Picnic. Both will need lots of hands to make these events successful. You will be hearing more about these events at the coming meetings and in the *Carrier*. September will be our next auction and October brings Pacificon. Keep these events in mind as all of them will need helping hands to make them successful. Get out there and support our club.

I would also like to thank our auction team for putting on another great auction for our club.

Propagation appears to be improving as both spring and the sunspot numbers increase. Looking forward to hearing you on the bands.

73, Sam

Inside

From the Repeater Committee

By Jim Brunk, Chairman

Signal Strength

The committee would like to thank Bob, KO6VV, Philip, KF6MXK and Michael, KF6KDA for signal reports last month. The report form was printed in the February *Carrier*. It is also found on the Design Link BBS in the repeater section and is on the MDARC web page at the specific address of http://www.mdarc.org/rrrcs1.html. If you encounter signal strength of less than S9 or have any other comments, send in a report.

These surveys allow us to find out where the poor locations exist. With this feedback, we can plan for future system enhancements. Please help us out.

Mt. Diablo Rebuild Officially Completed

The rebuild of the storm-damaged systems on Mt. Diablo has been completed. From the 12th of December 1995 to the 7th of March 1998 many people have been tirelessly working to get the repeaters back up working as well as they had prior to the day the tower went down. We now have good position on the tower, rack space in the main building and a long-term relationship with American Tower Systems. I am grateful to all those who helped complete this long task. Let's hope that we never have to rebuild under these circumstances again.

Control Code Change Coming

The control codes for the repeaters will change on May 1st. Those people who have paid the repeater support fees will receive a letter with the new codes and autopatch procedures shortly after the 15th of April. These features are available to those who pay for the support of the repeater. If you find yourself interested in these additional repeater options, you should contact Pete Smith, W6NZY, and (510) 680-7106 to gain these privileges.

Mt. Diablo Amateur Radio Club W6CX

P.O. Box 23222
Pleasant Hill, CA 94523
(510) 932-6125

The Carrier is a monthly publication of the Mount Diablo Amateur Radio Club (MDARC). It is the policy of the editor to publish all material submitted by the membership provided such material is in good taste, relevant to amateur radio and of interest to MDARC members, and space is available.

All material must be submitted to the editor by the first of day of the month of publication. Material is accepted on a first-in, first-out basis. Articles and other material may be submitted via Internet email to w6uv@home.com (preferred), w6uv@dnai.com, or delivered to the editor at the address listed below. Material will be accepted in plain ASCII, Word for Windows, or WordPerfect format. Material may also be submitted as hardcopy.

W6CX Repeaters
147.060/+ (100 PL)
224.780/- (077PL)
441.325/+ (100 PL)
ATV: In 1253.25 Out 427.25 (Cable Channel 58)

A Disturbing Practice

By T.O.M.

One of the uses of ham radio is to provide assistance in the event of an emergency. When one encounters a reason to call for assistance, it is the usual practice most places to interrupt an on-going QSO with the word "Break" if you have priority traffic, or "Break-Break" for emergency traffic. Emergency traffic is generally defined as something related to immediate danger to persons where priority is all other emergency related traffic that can affect safety.

Lately, a number of operators on W6CX have used the word "Break" to gain access to on-going QSOs. This is not a preferred practice and one should not use this means of entering a non-emergency or priority QSO.

If you wish to interrupt a QSO for priority or emergency reasons, by all means say "Break" or "Break-Break". The users of the frequency should immediately turn the frequency over to you. And not with a message such as, "OK, breaker, just a minute..."

If what you wish to do is to join a QSO in progress, the preferred method is to announce your call as the frequency is being handed over from one operator to another and wait to be acknowledged. If you want to use the frequency for a brief call or for autopatch purposes, the usual practice is to say, "Call, Please" and wait for the users of the frequency to acknowledge you and tell you to go ahead. Common courtesy dictates that you be brief in your use of the frequency and return it to the original users with a "Thanks for the use of the Frequency" message.

By following these preferred practices regarding breaking into QSOs, we can all be assured that when an emergency does occur, others will promptly clear the frequency for use by the station handling the traffic and giving aid.
-The Old Man

The Amazing Vibroplex Bug

By Richard Shappee, WA5HQJ

Many new hams have found it difficult to achieve mastery of the Morse Code and this is often attributed to their incorrect adjustment of their telegraph key, in particular, the Vibroplex key or "Bug" as it is often called. In the desire to help new-comers, some time ago instructions for adjustment and modification to keyers were provided and are reproduced below in the hope that this month of April many new hams will benefit from the information.

"By following these instructions, one can get top performance out of a Vibroplex Machine. It is the Trichotometric Indicator that usually needs attention. Our Engineering Department provided the following information.

We have experienced a particular difficulty with compound transmission of the pandemonial support pins. The difficulty you have with the Vibroplex is caused by the old style hex-nut. Since the old style hex-nut, due to its design had to be screwed off to be screwed on, the only way to tighten it was to loosen it. Our maintenance people inspected its inherent design feature which proved that it must be fully screwed on before it can be screwed off, and that this would solve the problem of becoming looser when it is tightened in that it must be loosened to tighten it and therefore should become a logical replacement of the older nuts which had to be fully screwed off in order to screw them on and consequently become tighter as they were loosened instead of looser as they were tightened.

A further problem of less alarming proportions need to be solved to insure proper operation. This has to do with the complexities involved in loosely tightening as opposed to tightly loosening. Some of our Extra Ham Operator Consultants are actually not clear on this point.

Upon adoption of the suggested modification of the Trichotometric indicator by our experts in the machine invention center we turned it over to our Special Research center for fabrication. The machinist experienced some difficulty in lay-out of the rectabular bracket. What happens is that it becomes part of the width at the other end. Thus it is difficult to determine

whether the thickness is wider than the width or the width is thicker then the thickness. When the bracket is laid down flat it is actually standing on edge and therefore must be stood up to lay it down. Therefore, during modification, all horizontal holes must be drilled vertically and all vertical holes horizontally, except when the bracket is in the horizontal plane, which can only be achieved by mounting it vertically.

If this is not clear, please so notify and we will send more detailed instructions of how to install the indicator. One further item should be pointed out. Our laboratory technicians had considerable difficulty in establishing the correct torque between ambihelical hex-nut and the indicator support. He had to turn the nuts to the left in order to make them go to the right. Once you have mastered this technique, assembly is easy but in reverse.

The new modification instead of requiring loosening to tighten it, performs this function automatically, in that as the Vibroplex Machine shakes apart. During the operation of pounding the lambic Key it gradually tighten up. This is revealed for the first time in utmost confidence from our Consultants. At this moment this improvement outranks all competitors for leadership in this field.

We believe our equipment to be the best on the market. After you have followed the instructions above, you will find that sending Morse Code is a pleasure."

I hope that members of MDARC will find this all helpful.

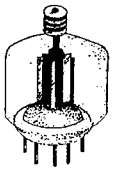
Ramblings From The Editor

By Jerry Gardner, W6UV

Spring is here and it looks like propagation on the HF bands is on the upswing. Those of you who haven't been around long enough to remember the last solar cycle will be in for quite a surprise in the next few years. How about worldwide contacts on 10 meters with 10 watts?

I've read recently that the number of codeless technicians who upgrade to the higher class licenses is in a tailspin. Sure, the tech license gives you *all* privileges on frequencies above 50 MHz, but you're missing so much more on the low bands. Think about it.

Doesn't anyone monitor the FM simplex frequencies anymore? I monitor the 2 meter and 440 MHz simplex frequencies whenever I'm in the car, and I'm lucky to hear one or two stations a week. Sure, the signal levels usually aren't very high, but simplex is about as close to a weak-signal mode as you can get on FM. So the next time the repeater is being jammed into oblivion, how about switching to 146.52 and giving me a call?



Power to the People! Part II

By JC Smith, KØHPS

Last month we covered "Battery Basics 101" and took a look at the pros and cons of a few specific types of batteries. This month we will be learning how to size the battery and how to get the most out of the system. We will be using the term "battery" to refer to a series of Voltaic cells connected in series and/or parallel to yield the desired voltage and capacity regardless of any specific physical configuration. A battery can be made up of a single small 12 Volt gel cell package or a rack of giant, individual 2 Volt cells in a series-parallel configuration yielding any voltage or capacity we desire. For most of us what we need is somewhere in between.

There are two different scenarios to consider when we discuss battery power. One is a system where the battery is the primary power source and is cycled through a significant discharge and charge cycle on a regular basis. This would be the case for an off-grid, solar charged system. The other case is where the battery is connected to the utility grid by means of an AC→DC power supply and is used to provide reserve power when the AC powered supply is not keeping up either because we are drawing more current than the supply can produce or because the utility power is off line. This latter case is what most hams are concerned with. It is the simplest and least expensive to deal with, and is the system we will consider first. In this case we are basically creating a UPS (uninterruptable power supply).

For either of the above scenarios we will need to calculate two things. We will need to know the maximum possible current draw in order to do cable and fuse sizing, and we will need to know our load size and duration in order to size the battery. For our maximum draw it's just a matter of adding up the current figures from our equipment specifications (keeping in mind that transceivers have vastly different current consumption between transmit and receive) and deciding how many of our "rigs" could possibly be transmitting at one time. We also need to consider the voltages. Fortunately, most of the equipment in a modern ham shack runs on a nominal 12 Volts DC.

Many ham shacks also have a computer running on 120 Volts AC. Desktop computers use quite a bit of power and if we want to keep these running on our battery system we will need an inverter to produce the 120 VAC and a much larger battery and AC→DC power supply. Many laptop computers will run directly off 12 Volts DC, and consume far less power than desktop models. They are worth considering for a serious DC power setup. Most shacks also have a variety of wall warts powering small accessories such as scanners, Morse keyers, packet TNCs, lighted SWR meters or tuners, tape recorders, frequency counters, audio amplifiers, etc., etc. In case you aren't familiar with the term, a "wall wart" is a small power supply that converts 120 VAC to something like 3, 6, 9 or 12 Volts (usually DC). They hang on the wall receptacle by means of their built in plug prongs. They are usually just large enough to cover all the other outlets on the receptacle, thus rendering the receptacle useless for anything other than that one wall wart. I HATE WALL WARTS!!

Sorry... back to our problem. Fortunately, most wall wart powered equipment designed for the ham shack will also run on 12 VDC, even some equipment that is powered by wall warts of other voltages. Check the specifications before you try it, but you will find that many items specify a voltage of 6-25 Volts or some such thing. If you have some item that must have DC power other than 12 Volts you can do one of three things. You can find a way to do without it during a power outage (remember, we are considering the case where the battery system is serving as a UPS, not where it is primary power), you can add a small inverter to the system, or you can add a voltage regulator to drop the 12 Volts down to the required voltage. Doing without or using the regulator makes the most sense. It seems foolish to convert our 12 VDC to 120 VAC only to convert it back to DC again with a wall wart. There are losses involved in all these conversions, particularly the inverter stage. Some inexpensive inverters are only 60% to 70% efficient.

For the sake of an example, let's consider a typical shack where all the equipment can be made to run on 12 VDC except the computer and the antenna positioner. We decide we can do without the computer (maybe it has it's own UPS to allow us to shut it down without loosing any files) and the antenna can just stay where we had it pointed when the utility power went off line. This makes things easy (we will consider adding an inverter in a later scenario). We can make up a simple chart listing all our equipment and the current it draws. Let's do one for a typical shack. You can find these numbers on the specifications pages of your owners manuals, and occasionally on the gear itself.

HF rig (100 W)	20A transmit (full power), 2A receive (full audio)
VHF/UHF (50 W)	10A transmit (full power), 2A receive (full audio)
scanner	1.5A (full audio)
VHF packet TNC	0.05A
antenna tuner	0.1A (lighted meter), 0.0A (unlighted)
Morse keyer	0.35A

Let's assume the worst case where the VHF/UHF is on the local packet frequency and the TNC is connected, ready to receive into it's mailbox any packet traffic that might come in. We are also on the HF rig and both rigs are set to full power. All the other equipment is on. If we happened to have a packet message come in while we were transmitting on HF our max current draw would be: 20 + 10 + 1.5 + .05 + 0.1 + 0.35 = 32 Amps. If we never use our packet station in the "robot" mode, but instead monitor the local repeaters with the VHF/UHF our max current would be about 24 Amps. We can add or subtract other equipment as necessary for any particular shack setup. We will use this number later when we size the fuse and main DC power cable (and when we do that we should also allow some room for expansion).

Next we need to decide how long we want to be able to continue operation after the utility power goes off line, and which pieces of equipment we can do without in this situation. We'll use this information to size our battery. We should also consider lowering our output power on transmit. In an emergency we can accept a little white noise on an FM signal, or a 589 instead of 599 on CW, particularly if we are trying to extend our operating time to the maximum. (Remember, one S-unit is 6 dB, and we only loose 3 dB by cutting power in half.

I challenge anyone to hear the difference a half S-unit makes.) If we aren't concerned with disaster situations, only inconvenient power outages, maybe all we want to be able to do is finish up our QSO in an orderly manner and advise the op on the other end that we will be back on frequency as soon as the power comes back on line. However, as hams we should all be prepared to help out with disaster communications, and if we are going through the exercise of setting up battery power it's a small extra chore and very little extra cost to set up for at least some extended operation.

When we calculate our power consumption for an extended period we need to consider what percentage of time we will be transmitting, and what mode we will be using. Running 50 Watts on FM may well consume more power than 100 Watts on CW or SSB. Let's say we want to have three hours of operating time and we might be transmitting a total of one hour during that time. Figuring one hour at 20 Amps for the HF rig on CW or SSB would be far more conservative than figuring 10 Amps for the VHF/UHF on FM. In reality they would probably consume about the same amount of power for a given amount of transmitting. FM is not a very power-efficient mode.

Let's use that three hours and the one to two ratio for transmit/receive. Let's further assume that we are willing to cut our power in half (which won't even be noticed on the other end in most cases). Let's say that we also want to be able to monitor some VHF/UHF frequencies at the same time, but that we don't need all our equipment all the time. A conservative estimate would be 10 Amps for an hour of transmitting on HF, 2 Amps for two hours of receiving HF, and 2 Amps for three hours if we did our monitoring with the VHF/UHF instead of the scanner. Of course if we were operating with the VHF/UHF rig we would have to be monitoring with the scanner, but then we could have the HF rig turned off and overall power consumption would be less assuming we also cut power 50% on the VHF/UHF.

Remember those Amp-hours (A-hrs) from last month? (Battery size is rated in A-hrs at a 20 hour discharge rate. Review Part One if necessary.) Let's calculate the A-hrs we will be consuming. (10A x 1 hr) + (2A x 2 hr) + (2A x 3 hr) = 20 A-hrs. Great! So we just go out and find a 20 A-hr battery, right? NAAAAAA! Wrong.

First of all, we would never discharge a battery 100%. Even if we could keep our gear running at the low voltages we would see as we drained the last few electrons from our "electron tank" it would destroy our battery to do it. Secondly, in this example, if we use a battery that is minimum size we will be drawing the power at far greater than the 20 hour rate, which means we won't get the rated capacity from the battery. Let's look at this second item a little further.

To review quickly, if we have a 100 A-hr battery and discharge it at a rate of 100/20 or 5 Amps, it should (if new and fully charged) run for 20 hours before reaching 1.75 Volts per cell (10.5 Volts for our 12 Volt battery) which is approximately 80% of full discharge. This relationship is not linear. If we discharge at 10 Amps we will have less than 10 hours before we reach 10.5 Volts, and if we discharge at 2.5 Amps we will have more than 40 hours. There is a mathematical relationship (the Peukert Equation[1]) between rate of discharge and the percentage of rated capacity a battery will yield. Some approximate numbers are as follows: the 10 hour rate yields 90% of the 20 hour rate capacity, the 5 hour rate yields 80% of the 20 hour rate capacity and the 1 hour rate yields 50% of the 20 hour rate capacity. This means that at a 10 Amp draw our 100 A-hr battery becomes a 90 A-hr battery, at 20 Amps it's an 80 A-hr battery and at 100 Amps it's a 50 A-hr battery.

In our example, we want 20 A-hrs over 3 hours or an average of 20/3 = 6.7 Amps. This is a 3 hour rate if we want a minimum sized battery and a rough interpolation of the above relationship tells us that we will only get 70% of the rated capacity at this draw rate. Therefore, as a bare minimum, we would need 20/70% or 28.6 A-hr battery. This assumes we will always have a new battery, we are willing to draw it down to 1.75 Volts per cell, and that our equipment would continue to operate at this low a voltage (10.5 Volts). None very likely. How low a voltage our equipment will operate on is a function of the individual piece of gear. How far down we are willing to draw our battery is a function of how long we want it to last. (To those who catch the error in this paragraph: remember, it's small, it's on the conservative side and it makes things much simpler.)

The life of a battery is proportional (inversely) to the depth of discharge. This too is a geometric (not linear) relationship. If you draw a battery down 50% it may last 400 - 500 cycles. If you draw it down 80% it probably won't last 200 cycles. If, however, you only draw it down 25% it will last over 1000 cycles and if you keep the discharge to 10% - 15% it will last "forever." For this reason it is very important in a system where the battery is the primary power source to have it sized generously, and even in a back up mode it is best to have at least twice the battery capacity you plan to use in the worst case. In our example this would bring us up to 57.2 A-hrs. Even this may not be enough if we find that the voltage is dropping below our equipment's tolerance before we reach the end of our desired operating time.

In the real world you can't go out and buy a 57.2 A-hr battery anyway. You may find something close (Johnson Controls makes a 12 Volt, 55 A-hr battery and Power Sonic makes a 12 Volt, 60 A-hr battery) but you may find that these special sizes cost more than a larger one. The above two list for $119 and $117 respectively, and for that you could have a pair of Trojan T-105s yielding 225 A-hrs at 12 Volts. Of course there may be other considerations such as size, weight and storage location.

It is often best to look at what batteries are available within our price range and work the numbers in reverse to see what kind of run time each will give us. Many hams in the above situation would just go out and buy a 100 A-hr marine deep cycle battery for $50 at Costco or Walmart. That's what I did, but they were on sale so I bought two. When I replace them it will be with the Trojan T-105s or T-125s (6 Volt golf cart/fork lift/RV batteries wired in series to yield 12 Volts). Using either of these batteries in the above scenario would yield significantly more operating time. Not only because of the increased capacity, but also because of the lower relative discharge rate. The 100 A-hr battery would be operating at close to the 20 hour rate, and the 225 A-hr battery would be approximately at it's 40 hour rate.

Something else needs to be considered, and this is a good time to do it. Batteries experience something called "bounce back." Most of us have experienced this in one way or another, probably when trying to start a car with a near-dead battery. Bounce back is the tendency of a battery to increase it's voltage as it sits under no load. It's a chemical thing and has to do with the homogeneity of the electrolyte. You don't really get any more capacity out of the battery, but

you do get the electrons delivered at a higher average voltage which has the effect of allowing us to operate for a longer time before we reach the minimum voltage our equipment will tolerate. We don't always have the luxury of dictating our operating schedule, particularly in an emergency, but it's something to consider if we are ever in a situation where it may be necessary to get every last possible electron out of our battery.

OK, we just spent a couple thousand words figuring out that most of us would be well served by a typical 12 Volt, 100 A-hr deep cycle battery, or if space and budget allow, two 6 Volt "golf cart" batteries in series. Hook this up in parallel with your power supply and you're in business. That's the condensed version. However, maybe you don't like the cookie cutter approach. Perhaps you want to do something much smaller for a QRP backpacking station or something much larger to run a cabin or an RV off solar power. It's nice to know how to figure things out for yourself, and that's what ham radio is really all about anyway.

Next month we'll discuss how to size battery cable, fuses and other components, and how to hook things up. We will also get into keeping the batteries charged. I know I said we'd cover that this month, but the sizing discussion ran longer than anticipated. We'll also discuss the differences in charging strategies for UPS systems and for systems designed to be routinely discharged, and I haven't forgotten that I promised to discuss inverters and solar power. Stay tuned...

1. Pukert Equation: $C = i^n t$
where:
C is capacity in A-hrs
i is current in amps
t is time in hours
$n = (\log t_2 - \log t_1)/(\log i_1 - \log i_2)$

NETS

W6CX Nets

APRS Net	Tuesdays 1930 Hours 147.060/+ (100 pl) Net Control: Barry, KC6WYA
Phone Net	Thursdays 1930 Hours 147.060/+ (100 pl) Net Control: Jay Caldis, KT6Y
ATV Net	Thursdays 2000 Hours Net Control: Mike Burke, KB6RMT Alternate: Sylvia, KC6YJV
Youth Net	Thursdays 1900 Hours 147.060/+ (100 pl) Net Control: Jeff Burke, KE6YAW

Contra Costa County Emergency Services HF Net
First Thursday following first Wednesday, 2000 Hours, 3.895 MHz. Net Control: Richard Shappee, WA5HQJ

Sheriff's Amateur Radio Communications Team
Clay Yale, N6YBQ
(510) 228-8223

CCRA Net ***Mondays 1935 Hours***
147.735- 145.49- 145.41- PL: 107.2

CCCC Net ***Thursdays 1930 Hours***
145.11- PL: 82.5

Contra Costa County ARES/RACES Nets
Thursdays, 1900 Hours

Central County	145.680 Simplex Jim Brunk*, N6BHX (510) 372-8248
East County	146.535 Simplex Jim Tittle*, KC6SOE (510) 432-3220
South County	146.355/+ (100 pl) Ed Ritchie*, K6SFD (510) 837-3265
West County	145.110/- Rich Parker*, KD6JCT (510) 237-2777

QSY to 147.735/- at 1920 Hours
Meeting of all County ARES/RACES Nets
Sam Lipson, District Emergency Coordinator, KO6JR
(510) 229-5705

* Assistant District Emergency Coordinator

W6CX Signal Strength Report Form

The Rocky Ridge Repeater Committee is trying to determine how our new antenna location has affected coverage. We would appreciate it if as many members as possible would fill out and return the attached form. If you operate from multiple locations, with multiple radios or antennas or on multiple MDARC repeaters, please copy the form and submit one for each location, radio, antenna and repeater. Please fill it out as completely as possible, but if there is some information you do not know don't let that stop you from sending it in. The more replies we can get the better we will be able to evaluate our coverage and make plans for improving it.

Please send your replies to Jim Brunk, N6BHX. Mailing address: 514 Palms Drive, Martinez, CA 94553. E-mail: brunk@ix.netcom.com or via the DesignLink BBS. This form is also available on the MDARC Web Page and on the DesignLink BBS.

If you are using a "beam" antenna, be sure it's pointed at the top of Mt. Diablo.

Which repeater? • 147.060 • 224.780 • 441.325

Your location (city and cross streets please):

Height of your antenna above ground:

Type of antenna:

Gain claimed by antenna mfr.:

Length and type of coax (if any):
Type of receiver:

Received signal strength:

Are you using a preamp? If yes, how many dB gain?

Comments? (Please include any pertinent information such as if there is a big hill directly between you and the top of the mountain.)

CALENDAR OF EVENTS

April 6	7:30 pm	MDARC Board Meeting	Emil Villas, Concord
April 17	8:00 pm	MDARC Meeting	Our Savior's Lutheran Church 1035 Carol Lane, Lafayette
April 27		May *Carrier* Deadline	
May 3	7:00 am-Noon	Livermore Swapmeet	Las Positas College, Livermore 1st Sunday every month
June 7	1:00 pm	Sunnyvale VEC Exams Gene Capener, WW6H, 510-254-5090	Consolidated Fire Training Center 2945 Treat Blvd., Concord 1st Sunday even months

The Carrier
Newsletter of the Mt. Diablo Amateur Radio Club
P.O. Box 23222
Pleasant Hill, CA 94523

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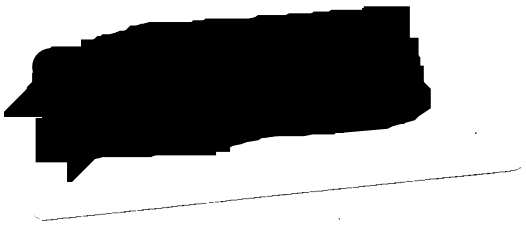

MDARC Meeting April 17